Chapter

An Analysis of Economic Determinants and Crime in Selected Gauteng Local Municipalities

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Abstract

The relationship between macroeconomic objectives and crime is intertwined and cannot be overemphasized. This subject has created an endless debate and at the centre of this debate is what causes the other? In contributing to this academic debate, the current study investigates the impact of macroeconomic objectives on crime. Furthermore, the study examined the question "what causes the other?". In achieving these two aims, the study employed a Pooled Mean Group and the Granger Causality analysis from 1996–2019. The Pooled Mean Group results reveal that poverty and inequality are the main causes of crime in the Gauteng province. On the other hand, economic growth, education and employment reduces crime. Since Gauteng is the economic harbor of Africa, many jobs should be created therein to reduce poverty and inequality that have a negative impact on crime.

Keywords: macroeconomic objectives, crime, Gauteng, Pooled Mean Group, Granger causality

1. Introduction

Over the years, the typecast perception that crime remains high in South Africa has become exact and unquestionable. This notion is illustrated by the current high crime rate of 85 percent [1]. Worth noting is that South Africa's crime rate began to rise around the 1980s and intensified after 1994. One of the contributing factors is the increase in population growth that increased crime activities such as murder, robberies, car hijacking, property theft and domestic violence [2]. The Gauteng province is not exempted from this challenge since it is the economic harbor of all African countries. It is one of the most well-developed provinces in the continent in terms of financial and economic standards [3]. The province contributes about 40 percent towards the Gross Domestic Product in South Africa, and 10 percent towards the Gross Domestic Product in the continent [4]. The province also attracts domestic and international investors through the Johannesburg Stock Exchange and other key economic sectors such as mining, manufacturing and service sectors [5]. All these economic activities attract crime, thereby conferring the obligation on every government to minimize crime as it has economic, social, emotional and physical effects. Thus, the United Nations Goal 16 of violence reduction, peace and justice should be upheld [6].

In reducing violence and maintaining peace, macroeconomics objectives should be promoted, and a balanced mix should be maintained. There are two schools of thought on crime reduction and macroeconomic objectives, namely the complementary view and the substitutive view. The complementary theory posits that a balanced macroeconomic mix reduces the crime rate in any economy [7]. That is to say, sustainable economic growth, employment, reduced poverty, stable prices and international trade improve the individual economic welfare and eventually reduces crime. The substitutive theory postulates that there is no empirical evidence to back the claim that a balanced macroeconomic mix reduces crime. Rather, the theory contends that unemployment, poverty, stagnant economic growth, inequality and high inflation increases crime activities. Simply put, a lack of economic development in any economy leads to an increase in criminal activities. The authors further assert that poverty and inequality have negative effects on society [7, 8].

There is no doubt that the relationship between macroeconomic objectives and crime has created an endless debate. Hence, investigations are continuing to contribute to these debates. This chapter is one of the studies contributing to this debate by analyzing the impact of macroeconomic variables on crime, with a focus on Gauteng's municipalities. The chapter is envisaged to make three contributions. First, several studies have focused on the effects of crime on macroeconomic objectives, and according to the author's knowledge, no study has examined the impact of macroeconomic determinants on crime. Second, few studies done on economic variables and crime were on a national level, and few/no studies were done on a local municipality level. Thus, the study is expected to cover this research *lacuna* by examining the nexus between economic variables and crime in the economic harbor of Africa. Third, this study focused on all macroeconomic objectives with the recommendation that if all these variables are addressed, crime will decline. Therefore, the study used economic growth, income inequality, poverty, trade openness and inflation as independent variables, and all the crimes committed in the Gauteng province were used as dependent variables.

2. Gauteng crime stylised facts

Crime in South Africa can be traced back to the apartheid era. Although crime can be traced back to the apartheid era, violent crime rose sharply from 1994, and it is continuing even today. An average of 17 000 murders have been recorded for the past three decades [2]. This trend is also the same on murder. The murder related crimes existed since 1950 and rose to the peak slightly before independence, that is 1993. Post-independence murder related crimes declined by an average of 4 percent upto the year 2015 [2]. This was regarded as a significant change considering the high population growth. Currently, the murder related crimes are high but not as high as pre-independency.

Worth mentioning is that national crime trends are more similar in major cities such as Durban, Johannesburg, Pretoria and Cape Town. However, this study focused on the Gauteng province. The province is dominated by crimes such as robbery (includes car hijacking) and common assault recording an average growth of 2.8 percent and 2.1 percent respectively for the past decade. These two crimes were caused by the abuse of alcohol, domestic violence misunderstandings and firearms ownership [2]. It is reported that the majority of the people that own firearms do not have licenses and are therefore not trained to use them. Sexual offenses and murder were also found to have an average growth of 1.7 percent and 1.4, respectively [2] (SAPS, 2020). Sexual offenses were caused by dysfunctional relationships and the lack of social skills in society. Furthermore, murder was driven by violence,

arguments, revenge and community retaliation. Of importance is that unemployment was also found to be the main cause of all these crimes. By its expanded definition, unemployment in Gauteng is recorded at 46 percent [2].

3. Literature review

The relationship among economic growth, poverty, inequality and crime can be explained by social disorganization theory, Becker's economic theory and the strain theory. All these theories combined best explain how variables under study contribute to well-being of the society. For example, social disorganization theory posits that poverty, stagnant economic growth and inequality weaken the organization of the society [9]. Importantly is that the social disorganization is disturbed by the economic operations of that society. In the event of shortage of basic goods and services, lack of income and lack of economic activities bring both economic and social stabilities leading to an increase in the crime activities increases in a society. The social disorganization theory is closely linked with the strain theory which stipulates that individuals with the low level of income tend to be frustrated when they are surrounded by those with high level of income [10]. The strain theory put more emphasis on lack of economic activities to murder, prostitution, property theft, robberies, violence etc. Worthy mentioning is that lack of economic activities has led to an increase in the commitment of these crimes. Therefore, criminals the probability of getting caught vs. their suffering and end up engaging in crime activities [11].

Becker further pointed out that poverty, stagnant economic growth and income inequality force low-income households to commit crime to improve their economic situations. The theorists emphasized that the cultural and educational background plays an important role in crime activities. For instance, a school drop-out have forgo the legitimate living by earning a decent salary, however, lack of schooling increases the chances of increasing crime in that society. Because of that reason, unemployment will increase, poverty increases, income inequality widens and economic growth remains stagnant. In summary, all these three theories complement each other. All the theories point to the fact that economic factors have a bigger to play to the well-being of a society. If the economics is not right, then the society becomes disintegrated causing an increase in crime.

Anser et al. [12] studied the economic growth, inequality, poverty and crime nexus in 16 different countries. The study used the Generalized Method of Moments from 1990–2014. The results indicate that unemployment and income inequality have an inverse relationship with crime. Thus, an increase in the income gap between the rich and the poor and increase in unemployment lead to an increase in the number of crimes in these countries. Webster and Kingston [13] investigated the nexus between poverty, inequality and crime in Britain. The authors found out that crime increased as the poverty rates and income inequality increased. This was more practical during 1980 to early 1990s where unemployment was significantly high and after the Global financial crisis of 2008. Using a Wald causality test, Tang and Lean [14] examined the inflation, unemployment nexus in the United States from 196—2005. The results reveal a positive relationship between crime and inflation. The authors argue that an increase in inflation causes an increase in crime activities. Furthermore, the authors argue that inflation causes unemployment and unemployment causes crime.

A relationship between poverty and crime was also investigated by Cheteni et al. [7], Dong et al. [15], Kaylen and Pridemore [16] and Hooghe et al. [17]. For instance, Cheteni et al. [7] examined the association between drug-crime and poverty in South Africa. The authors employed an Autoregressive Distributive Lag from 1995–2016 and found a strong positive relationship between poverty and crime.

Kaylen and Pridemore [16] posit that poverty causes homicide tendencies and concluded that poverty and homicide are inseparable. This is in line with the study done by Dong et al. [15] who examined the relationship among income inequality, poverty and crime in China. The study focused on homicide cases from 2014 to 2016 and found that low-income households commit homicides crime compared to middle and upper earners. Hooghe et al. [17] studied the impact of unemployment on crime from 2001 to 2006 in Belgian municipalities. A spatial regression was employed and the results reveal that unemployment and inequality causes crime in these municipalities. Another observation is that crime related activities are more in urban municipalities compared to rural municipalities. An interesting result was found by Metz and Burdina [18] who found that a huge gap between average earners and low-earners causes crime related activities such as robberies and house burglar. Garidzirai and Zhanje [19] and Jonck et al. [20] argue that education contributes to crime reduction to a larger extend, thus, it should be promoted for economic development.

Goulas & Zervoyianni [21] investigated the relationship between crime and economic growth in 26 different countries over a period 1995–2009. The authors employed a panel data technique and the results reveal an inverse relationship between crime and economic growth. Thus, an increase in economic growth reduces crime levels in these two countries. Mullok et al. [22] studied the same relationship between crime and economic growth in Malaysia from 1980–2013. The authors employed a time series analysis: An Autoregressive Distributive Lag and results reveal a strong positive relationship between economic growth and crime. The authors posit that an increase in the economic activities in the economy creates room for many crime activities. Prasad [23] examined the relationship between trade openness and crime in India. The study found that crime increases if the imports are encouraged in India. On the other hand, crime will reduce if the exports are more than imports. In Brazil, Dix-Carneiro et al. [24] document that crime should be analyzed from a labour market perspective. Thus, majority of the work-force should be employed to reduce crime. Therefore, trade liberalization should always address labour issues for crime to be reduced.

4. Research properties and methodology

This section discusses the data properties and research methodology used in this chapter.

4.1 Data properties

This chapter's data was sourced from the Global Insight and it ranged from 1996–2019. The chapter focused on Gauteng local municipalities namely: Ekurhuleni metropolitan; City of Johannesburg metropolitan; City of Tshwane metropolitan, Emfuleni, Lesedi, Midvaal, Merafong, Mogale city and Rand west local municipality. The data used for these municipalities include: crime, economic growth, unemployment rate, trade openness, education, poverty and income inequality. **Table 1** provides a summary of the variables used in this chapter.

An increase in goods and services is expected to reduce crime since economic growth increases job opportunities. This creates more income avenues. Conversely, economic growth exerts more crime when goods and services produced only benefits few people in a region. This leaves many unemployed youths with nothing to do and this breeds a seed of crime in a society. Employment is also expected to decrease crime activities according to the Becker's theory. The theory suggests that

Variable	Proxy	Description	Priori expectation
Crime	lncrime	All crimes committed in the Gauteng region	Dependent variable
Economic growth	lngdp	Increase in goods and services per population	+ or -
employment	lnemp	Number of people employed in the province	—
Poverty	lnpov	Number of people living under the accepted line	+
Trade openness	lntrad	Sum of exports and imports/ GDP	+/–
Income inequality	lngini	The income gap between the rich and poor	+
Tertiary education	lnedu	Number of people with at least a post-high school certificate	—

Source: Own Compilation.

Table 1.
Summary of variables used.

an increase in employment plays a critical role in reducing crime [14]. Poverty is expected to increase the crime rate in this study. The rationale is that poor households commit crime in order to improve their lives [13].

Trade openness is expected to influence crime positively or negatively. There are two reasons attached to this. First, if a country or a bloc uses many trade controls, majority of traders engage in illegal trade which increases crime in a society [11]. Second, a lack of economic or trade control increases the number of goods and services circulating in the society thereby decreasing crime activities in a society [11]. Income inequality increases the number of crime activities in a society. A huge income inequality frustrates households with low income and end up devoting to crime as a solution to their problems and this is in line with the strain theory of crime [10]. On the other hand, education is expected to reduce the number of crime activities in a society. Education increases some household earnings that leads to a higher opportunity cost of crime. Education also influence a household personality trait that makes one disciplined.

4.2 Descriptive statistics

The descriptive statistics summarizes the data set used in this study. It serves two purposes. First, descriptive statistics illustrates the basic information of variables employed in the study. Second, descriptive statistics shows the potential relationship among the variables used in the study. Thus, **Table 2** gives a summary of the variables used in the study focusing more on the mean of variables. The descriptive statistics illustrate that Gauteng trades with other provinces and this is shown by an average of 52 percent. The results also show the dominance of inequality and crime in the local municipalities shown by average of 41 and 40 percent respectively. The results are also in line with the national statistics [25]. In addition, poverty rate and unemployment were also found to be dominant in the province exhibiting an average rate of 30 and 20 respectively.

4.3 Panel unit root test

Panel unit root is the first estimation technique used in the estimation of variables. Garidzirai et al. [26] stipulates that it used to determine whether the variables are stationary and determine the order of integration. In achieving these two aims. Lin, Levin and Chu and the Pesaran and Shin were used to determine the stationarity of variables and order of integration. These tests have a null hypothesis of unit root test.

Variable	Mean	Standard Deviation	Minimum	Maxi
Lncrime	40.12	17.25	26.20	83.20
Lngdp	4.80	3.70	−1.29	9.02
lnemp	20.19	12.27	15.42	29.4
lnpov	30.39	14.21	14.32	45.29
lntrad	52.15	29.42	20.12	30.32
lngini	41.38	16.38	30.21	70.41
lnedu	20.89	6.83	10.59	50.28

Source: Own Compilation.

Table 2.
Descriptive statistics.

Thus, a null hypothesis is rejected if the p- value is less than 10 percent. The results reveal that lngdp, lnpov, lntrad and lngini are stationary at levels. Therefore, the variables are integrated at level one 1(1). Variables such as lncrime and lnunm were found not to be stationary at levels, therefore, became stationary at first difference. The panel unit root test concludes that the variables are integrated at 1(0) and 1(1). Noteworthy is that panel unit root test prescribes the research methodology to use. For instance, if the variables are stationary at levels, a panel least square is estimated while if the variables are of different level; levels and first difference then a Panel Autoregressive Distributive Lag is deemed fit [26]. In the event that the variables are integrated at first difference, a Panel – VAR or Panel – VECM is appropriate [27]. Since the panel unit root tests indicate a combination of zero and one a Panel Autoregressive Distributive Lag under the Pooled Mean Group is deemed fit (**Table 3**).

4.4 Methodology

Since the variables were found to be integrated at levels and first difference a Pooled Mean Group (PMG) was deemed fit for this chapter. A PMG allows the researcher to estimate the long-run relationship without performing cointegration tests since this model is the new cointegration test [26, 28, 29]. Another advantage of using this model is that it gives robust and accurate parameters. In addition, the model eliminates the risk of using data with a unit root and it is appropriate for all samples [30]. Furthermore, a PMG allows a researcher to analyze both short-run and long-run relationship. Noteworthy is that, a Hausman test was employed to confirm whether the PMG is the appropriate and accurate estimator to use. The PMG model is illustrated in Eq. 1:

$$\Delta lncrime_{i,t} = \varnothing_i \left(lncrime_{i-t} - \beta_i X_{i,t-j} \right) + \sum_{j=1}^{p-1} \gamma_j^i \Delta \left(lncrime_{i,t-j} + \sum_{j=0}^{q-1} \delta \Delta \left(X_i \right)_{t-j} + \mu_i + \varepsilon_{it} \right. \tag{1}$$

Where lncrime is the dependent variable and X = poverty, gini, unemployment, economic growth, education and trade openness in the Gauteng provinces. The signs δ and γ represents the short-run coefficients of dependent and independent variables respectively while I is cross sections and t for time. β is long-run coefficients while u represents fixed effect and e = error term.

Variable	Level	LLC	IPS	Decision
lncrime	Level	2.468	2.698	1(1)
	1st	1.390***	1.028***	
lngdp	Level	2.349**	3.198**	1(0)
lnemp	Level	−2.490	−2.681	1(1)
	1st	1.351***	1.987***	
lnpov	Level	−1.061**	−1.590*	1(0)
lntrad	Level	1.359***	1.592***	1(0)
lngini	Level	1.357*	2.490*	1(0)
lnedu	Level	0.987***	1.498***	1(0)

*Source: Own compilation from Eviews software. Note: *, **, *** represents 10, 5 & 1% respectively.*

Table 3.
Panel root results.

Variable	ADF Statistic	Conclusion
Lncrime	−5.30***	cointegration

*Source: Own compilation. *** represents 1 percent level of significance.*

Table 4.
Cointegration test.

To determine whether a long-run relationship exists, cointegration tests were employed using the Kao test. The test sets the null hypothesis on no cointegration implying there is no long-run relationship among the variables under study. The rule of thumb is to reject the null hypothesis if the variables are below 0.10 and conclude that the variables under study have a long-run relationship. The cointegration results are illustrated in **Table 4**.

5. Empirical results

This section reports the cointegration results, long-run relationship and the short-run relationship.

5.1 Cointegration results

Although other studies do not support the use of PMG cointegration test, this chapter carried the cointegration test using the Kao. The test results suggest the presence of cointegration between economic variables and crime at 1 percent level of significance. Since the cointegration among variables has been established, a long-run and short-run relationship was discussed using the Pooled Mean Group in section 5.2.

5.2 PMG results and discussions

The empirical results show a Hausman test of 0.3182 which accepts the null hypothesis that PMG is the appropriate estimator compared to MG and DFE. Therefore, this chapter used the PMG and compared with other estimators for robustness of the results. The PMG results illustrate that economic growth inversely influence crime activities. A 1 percent increase in economic growth decreases crime

by 0.48 percent. This negative coefficient is line with both the MG and DFE models and this supports the Becker's economic theory that states that economic growth reduces the level of crime activities in an economy. Furthermore, these results are in sync with other studies such as [21] who posit that an increase in economic growth reduces the level of crime in an economy. However, Mulok et al. [22] found interesting results that an increase in goods and services increases the number of crimes committed in an economy. Education is inversely related to crime in the Gauteng municipalities. A 1 percent increase in post-secondary education reduces crime by 0.52 percent. This result was expected and the findings are in line with the study done by Garidzirai and Zhanje [19] and Jonck et al. [20] who concluded that education gives a household exposure that reduces crime rates.

In line with a priori expectations, employment was found to inversely influencing crime in the Gauteng local municipalities. This result confirms the findings of Tang and Lean [14] who concluded that employment keeps individuals busy to the extent that they do not contemplate of crime activities. A 1 percent increase in employment reduces crime activities by 0.93 percent. The PMG results also illustrate that income inequality positively influence crime in Gauteng local municipalities. A 1 percent increase in income inequality increase the crimes by 0.87 percent. This result was expected and confirms the findings by Anser et al. [12] and Kingston [13] who concluded that income inequality increase crime activities in an economy. Poverty was significant and positively influencing crime which suggests that more people living in poverty are likely to commit crime in Gauteng local municipalities. This is shown by a 1 percent increase in poverty which leads to a 0.69 percent in crime activities. Cheteni et al. [7] and Dong et al. [15] also share the same sentiments that poor people have a higher probability of committing crime. This is also in line with the strain theory which stipulates that individuals with the low level of income tend to be frustrated when they are surrounded by those with high level of income [10]. Surprisingly, trade openness was found to be positively influencing crime but statistically insignificant.

Variable	PMG	MG	DFE
Long-run			
lngdp	−0.48*** (2.49)	−0.35* (1.39)	−0.67** (1.03)
lnemp	−0.93*** (−1.80)	−0.40** (−2.98)	−0.23*** (−2.29)
lnpov	0.69** (2.09)	0.03*** (1.02)	0.09* (1.39)
lngini	0.87*** (−3.47)	0.38** (−2.39)	0.27* (0.47)
lntrad	0.21 (2.39)	0.53 (3.40)	0.67 (2.50)
lnedu	−0.52** (3.59)	−0.30* (2.38)	−0.16** (2.20)
Short-run			
ECM	−0.6184*** (2.49)	−0.5175** (3.28)	−0.4827* (3.63)

Source: Own compilation.
*Note: *, **, *** represents 10, 5 and 1 percent respectively. Figures in parenthesis are T-statistics. Hausman test p-value 0.3182.*

Table 5.
Long-run and short-run results.

Table 5 also shows an Error Correction Model estimated using the PMG, MG and DFE estimators. Since Hausman test proposed the use of PMG over MG and DFE showing a significant and negative ECT of −0.6184. This means that 61.84 percent of disequilibrium in the Gauteng municipalities is corrected in the upcoming period. Thus, the model moves back to equilibrium after 1 year 6 months (1/0.6184). Banerjee et al., [31] share the notion that the higher ECT the stable the relationship between economic variables and crime in the Gauteng provinces.

6. Conclusions

This chapter examined the influence of economic factors on crime in Gauteng's local municipalities. The results reveal that the province is dominated by income inequality and poverty in Gauteng's local municipalities. However, the chapter also found that the stability of economic variables is instrumental in reducing crime in the Gauteng local municipalities. These results are in sync with the theoretical and empirical literature that reached a general consensus that economic growth, employment, low poverty rates, education, trade openness and low Gini coefficient reduce crime. Since crime, poverty and income inequality is dominant in the province, there is, thus, scope to promote education, employment and economic growth for crime reduction purposes. More efforts should be directed to the reduction of the aforementioned socioeconomic challenges. There has to be an increase in the education of technical skills that creates both formal and informal employment in the local municipalities. The chapter further suggests that the local government initiate community projects that create employment and income for the community members. Although this chapter has achieved its objective, one limitation has been identified. The chapter did not include other socioeconomic variables such as income, gender and age. However, these variables will be incorporated in the upcoming study.

Conflict of interest

"The authors declare no conflict of interest."

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